REMARKS

Claims 1-35 are pending to the present application. By virtue of this response, no claims have been cancelled, amended, or added. Accordingly, claims 1-35 are currently under consideration. Amendment and cancellation of certain claims are not to be construed as dedication to the public of any of the subject matter previously presented.

Response to Examiner's Comments

Applicants submit that one of the key differences between the current invention and the cited references lies in how dynamic information among the circuit components under simulation is communicated and what data structure are used for communicating such dynamic information during a transient simulation. It is known in the art that during a simulation, the simulator needs to keep track of port connectivity information of the circuit components. It is also known that during a simulation, the circuit components will go through different dynamic states. So the issue is not whether the port connectivity information or dynamic states exist or not, but how are they stored or used by the simulator.

In both of the Tcherniaev and Zhou references, they chose to store such information in the static database while the current invention uses a newly created dynamic data structure called the port connectivity interface for storing and communicating such dynamic information during simulation. However, there is major design tradeoffs involved in each implementation approach. The pending application describes the Tcherniaev and Zhou approaches in Figure 6 and its corresponding paragraphs [0018] – [0020] in the background section of the specification. Both the Tcherniaev and Zhou approaches employ pointers to pass such dynamic information through the subcircuit instances (See Figure 2C of Tcherniaev and Figure 10 of Zhou.) Therefore, to pass information from one subcircuit to the next subcircuit in a different hierarchical branch, such as from subcircuit 620 to subcircuit 622 as shown in Figure 6 of the pending application, the simulator of the Tcherniaev or Zhou reference would have to made multiple program calls (via the pointers). As indicated in the background of the pending application, <u>the problem with the method taught by Tcherniaev and Zhou references is that the dynamic information needs to traverse many levels of</u>

the hierarchical data structure before reaching its destination. At each hierarchical level, information needs to be synchronized before it may be transmitted to the next level, which the Tcherniaev and Zhou references are totally silent about these challenges. Therefore, the method of passing information through the hierarchies, as taught by Tcherniaev and Zhou, and synchronizing at each intermediate level would result in lower simulation performance.

Applicants will further discuss these points made in the above paragraph and will respond to each rejection of the Office Action in the following sections.

Claim Rejection under 35 U.S.C. § 101

Claims 1-35 stand rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicants respectfully traverse this rejection.

"Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. 101." (MPEP §2106(II)(A), emphasis added) Under this test, "[a] claim is limited to a practical application when the method, as claimed, produces a concrete, tangible and useful result; i.e., the method recites a step or act of producing something that is concrete, tangible and useful." (MPEP §2106(IV)(B)(2)(b), part ii). For example: "transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' – a final share price ...." (MPEP §2106(II)(A); citing *State Street,* 149 F.3d at 1373).

The Office alleges that the claims do not produce a useful, tangible, concrete result. Applicants respectfully disagree. As one of ordinary skill in the art would recognize, the result of "simulating operation of the one or more driver leaf circuit" as recited in Claims 1-35 generates predicted behavior of the circuit. Referring to Figure 1A of the present application, the simulation results (i.e., the predicted behavior) may be displayed, for example, "in the form of waveforms, measurement, or checks 110 on a computer screen for engineers to inspect ...." These simulation

results may be used to detect and correct design errors and to optimize design parameters, for example. Thus, similarly to the process in State Street, "simulating ... driver leaf circuits" as recited in Claims 1-35 is a practical application in the technological arts because it transforms data (e.g., a netlist description of the circuit) into a useful, concrete, and tangible result - simulation results such as, for example, waveforms or measurements. In particular, these simulation results are useful, concrete, and tangible in the same sense as was the final share price (a calculated number) cited in *State Street*.

In addition, claims 1-35 also describes maintaining "dynamic hierarchical data structures of the one or more driver leaf circuits and the one or more receiver leaf circuits". In *In re Warmerdam*, 33F.3d 1354, the Federal Circuit held that "Applicant's data structures are physical entities that provide increased efficiency in computer operation. More than mere abstraction, the data structures are specific electrical or magnetic structural elements in a memory." In *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, the Federal Circuit held that "whether stated implicitly or explicitly, we consider the scope of §101 to be the same regardless of the form, machine or process – in which a particular claim is drafted." Applicants submit that the dynamic hierarchical data structures of the present invention provide tangible benefits: data stored in accordance with the claimed data structures are more easily accessed and stored. It also facilities more efficient communication of signals during transient simulation of the one or more driver leaf circuits and the one or more receiver leaf circuits.

Hence, Applicants respectfully request that the Office withdraw the rejection under 35 U.S.C. 101.

Claim Rejection under 35 U.S.C. § 103

Claims 1-33 stand rejected under 35 U.S.C 103(a) as allegedly being unpatentable over Tcherniaev et al. (U.S. Patent No. 6,577,992, hereinafter the Tcherniaev reference), in view of Zhou et al. (U.S Patent No.6,807,520, hereinafter the Zhou reference). Applicants respectfully traverse this rejection.

In response, Applicants respectfully submit that each of the Tcherniaev or the Zhou reference, alone or in combination, does not teach or suggest each and every element of the pending independent claims 1, 12, and 23. Specifically, the combination of the references cited does not teach or suggest at least the element of "simulating operation of the one or more driver leaf circuits and the one or more receiver leaf circuits, together by using a port connectivity interface, without simulating operation of the third branch to determine a first set of changes in signal conditions shared by the one or more driver leaf circuits and the one or more receiver leaf circuits, wherein the port connectivity interface facilitates communications of dynamic information between the one or more driver leaf circuits and the one or more receiver leaf circuits, and wherein dynamic hierarchical data structures of the one or more driver leaf circuits and the one or more receiver leaf circuits are maintained."

The Office Action cites Figures 1-2, and column 8 line 1 to column 10 line 65 allegedly teaches these claim elements, Applicants respectfully disagree. As stated in Applicants' response to Examiner's comments above, merely mentioning the terms "port connectivity" and "change of node voltage" does not indicate a particular approach used by the simulator. On the contrary, the Tcherniaev reference teaches a different approach for storing and handling dynamic information created during the simulation. For example, the Tcherniaev teaches that "[T]he static storage may therefore store the matrix structure. As described above, the static subcircuit storage 212 may further include a subcircuit definition 217 that defines the subcircuit topology. In addition, the static subcircuit storage 212 may provide element definitions 219 associated with the subcircuit definition 217." (See Tcherniaev, column 9, lines 50-55, emphasis added.) The Tcherniaev also teaches that "[I]t is important to note that the circuit simulation is advantageously accomplished by traversing a hierarchical data structure such as that illustrated in FIG. 2A without flattening the hierarchical data structure." (See Tcherniaev, column 10, lines 7-10, emphasis added.) The Tcherniaev further states that "[I]n addition to sharing an equivalent circuit structure and therefore static subcircuit storage, two subcircuit instances may have an equivalent dynamic voltage state obtained during transient simulation. As shown in FIG.2C, multiple instances 224, 226, 228 of the same subcircuit definition may share the same static subcircuit storage 212 as described above." The Tcherniaev reference further teaches that "one or more pointers ... may be used to permit both the first instance 224 and

the third instance 228 to share this dynamic voltage state." (See Tcherniaev, column 10, lines 17-33, emphasis added.) Applicants also note that column 14 lines 39-54 and column 16 line 35 to column 17 line 47 of the Tcherniaev reference teaches updating rate of change in node voltage, again by using pointers to traverse the hierarchical data structure. It is clear that the Tcherniaev reference teaches storing dynamic simulation information in the static subcircuit storage and using pointers to traverse the hierarchical data structure for passing dynamic information among subcircuits under simulation. The Tcherniaev reference is totally silent about the challenges, such as multiple program calls and synchronization issues, associated with its approach. The present invention solves the problem by using the port connectivity interface to facilitate communication of dynamic information among circuit components under simulation.

The Office Action states that Tcherniaev "teaches a rate of change of node voltage and the share of dynamic load which would require the port connectivity interface, but the Office Action does not specifically identify which structure taught by the Tcherniaev reference is the port connectivity interface. Applicants invite the Office to identify the structure in the Tcherniaev or Zhou reference that represents the port connectivity interface of the pending application.

Regarding the Zhou reference, The Office Action cites Figures 4, 9, and 10, and column 12 line 58 to column 14 line 60 allegedly teaches these claim elements, Applicants respectfully disagree. Applicants note that the cut node method described in Figures 4 and 9 of the Zhou reference is similar to the static partitioning method described in Figure 5 and its corresponding paragraphs in the background section of the pending application. The method taught by Zhou is similar to that taught by the Tcherniaev reference. For example, the Zhou reference states that "[T]he connectivity information is a static database." "The static data structure 530 contains: 1) connectivity information; 2) model parameters; and 3) matrix formulations for the cell. This information is not time varying and is also the same for each instance of a same cell." (See Zhou, column 13, lines 5-16; emphasis added.)

In addition, the Zhou reference teaches that "[D]ynamic information is stored in a flattened way and static information is shared and stored in a hierarchical fashion by the present

invention." Because the dynamic information is stored in a flattened way, the dynamic hierarchical data structure is destroyed in the Zhou approach. Therefore, Applicants further submit that the Zhou reference does not teach or suggest at least the claim element of "wherein dynamic hierarchical data structures of the one or more driver leaf circuits and the one or more receiver leaf circuits are maintained" found in the independent claims 1, 12, and 23 of the pending application.

For at least the reasons presented above, Applicants respectfully submit that each of the Tcherniaev or Zhou reference, alone or in combination, does not disclose each and every element of the independent claims 1, 12, and 23. Applicants also assert that claims 2-11, 13-22, and 24-35, which variously depend from their independent claims, are allowable for at least the reason that they depend from allowable independent claims.

With respect to claims 2, 13, and 24, based on the arguments presented above. Applicants respectfully submit that the combination of the Tcherniaev and Zhou references does not teach or suggest at least the element "storing the first set of changes in signal conditions in a the port connectivity interface and conveying the first set of changes in signal conditions from the one or more driver leaf circuits to the one or more receiver leaf circuits via the port connectivity interface."

With respect to claims 3, 14, and 25, based on the arguments presented above. Applicants respectfully submit that the combination of the Tcherniaev and Zhou references does not teach or suggest at least the element "wherein the port connectivity interface is generated dynamically upon detecting a set of triggering conditions during simulation."

With respect to claims 4, 15, and 26, based on the arguments presented above Applicants respectfully submit that the combination of the Tcherniaev and Zhou references does not teach or suggest the specific data structures as stated in these dependent claims.

Claims 34-35 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Tcherniaev et al., in view Zhou et al., as applied to claims 1-33 above, and further in view of Johannsen (U.S. Patent No. 5,910,898). In response, Applicants respectfully submit that claims 34-35 are allowable for at least the reason that they depend from an allowable independent claim.

CONCLUSIONS

In view of the above, each of the presently pending claims in this ~~application is believed~~ to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 188122001900. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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